



# Upgrade Air Handling Unit System for Resident

STATEMENT OF WORK (SOW)

2016

## Index

---

1- General.....	2
2- Scope of Work.....	2
3- Equipment Data.....	3
4- Schematic Diagram.....	4
5- Sequence of Operation.....	5
6- Submittals.....	5
7- Quality Assurance.....	6
8- General Conditions.....	7
9- Codes, Standards and References.....	7
10- Project Schedule and Workers.....	7
11- Safety.....	8
12- Security.....	8
13- Coordination.....	8
14- Demonstration.....	8

# **DESCRIPTION OF WORK:**

## **1. General:**

- A. This is brief description of work to be performed at the site. Refer to the contract documents, codes and references for all work required to be done at the site.
- B. Project work scope entails supplying and replacing the existing residential Air Handling Units (AHU) 11 and 14 and it is control devices with new energy efficient same or more capacity models.
- C. All work shall be done in phases.
- D. The work shall include all labor, materials, administration, tools, consumable materials, and equipment, insurance, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings but which are usually provided or are essential for proper installation and operation of all systems as indicated on the drawings and specified herein.

## **2. Scope Of work**

The specifications and drawings describe the minimum requirements that must be met by the contractor for the installation of all work as shown on the drawings and as specified hereinafter:

Work shall consist of:

- A. Discount and removal of existing system components (AHU, temperature sensors, actuators, etc.)
- B. Provide and install new more efficient operation AHU's. The new system shall consist of: new temperature sensors, actuators, wiring, etc. to monitor and adjust all HVAC systems components.
- C. Re connect all devices, components and sensors
- D. Labelling all sensors and bus wiring at each end to identify what device and/or contact point is at the other end of the wire.
- E. Perform a comprehensive reprogramming of the new system.
- F. Test and commission for proper operation and hand over to the Contracting Officer Technical Representative (CTOR)
- G. All existing ductwork system, inclusive air outlets, shall be cleaned and sanitized
- H. Repairing any civil works resulting from the replacement.
- I. All metal and duct works necessary for the replacement.
- J. Discard of old AHU's as per local regulation.

### 3. Equipment Data

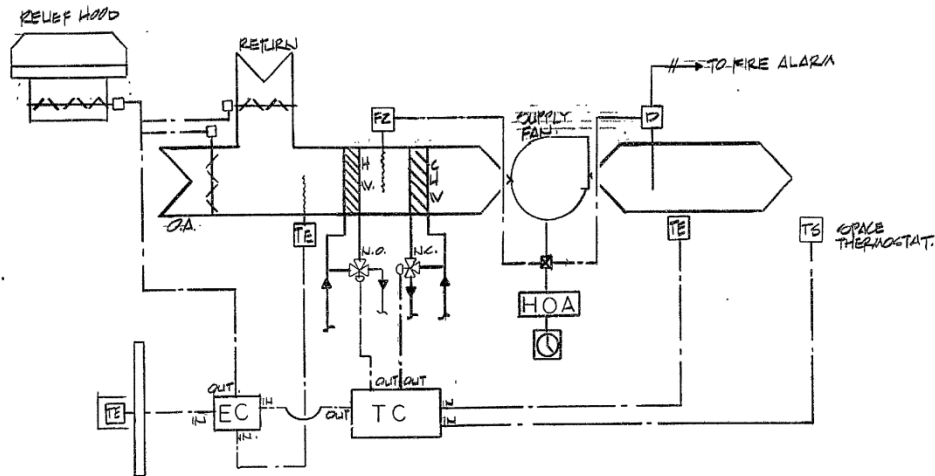
#### A. Building Automation System (BAS) data:

BACnet Protocol (network) – Niagara Graphic end user  
MNB 1000 and MNB300 controllers

#### B. AHU's data

Unit NO.	Service	Location	Supply FAN @380V-3Ø-50HZ						Return FAN Data@380V-3Ø-50HZ						Hot Water Preheat Coil @ 180 EWT/150 LTW									
			EXT.SP		Total SP		CFM	RPM	EXT.SP IN:H2O	Total SP IN:H2O	BHP	RPM	CFM	EAT	LAT	ΔP		GPM	FT:H2O	Area FT²	Rows	FPI		
			IN:H2O	BHP/HP	IN:H2O	BHP										IN:H2O	MBH							
AHU11	1st Floor	Garage Roof	4405	0.56	1.99	2.2/5	853	3630	0.73	0.76	1.5	567	4405	65	83	0.13	85.9	8.6	0.09	9.17	1	8		
AHU14	2nd Floor	Storage Room	1815	0.55	1.39	0.7/1.0	975	1665	No Return FAN				1815	65	87.9	0.08	38.6	3.9	0.13	4.72	1	8		
Chilled WaterCooling Coil @ 48 EWT/58 LTW																								
			EATF		LAT F		ΔP IN:H2O	Total MBH	Sens MBH	GPM	ΔP FT:H2O	Area FT²	Rows	FPI	Filter Type		Min outside Air CFM		Model					
			DB	WB	DB	WB																		
AHU11	1st Floor	Garage Roof	4405	83	65	54.16	54	0.73	145.2	138.9	29	13.7	9.17	6	14	Low Velocity	1200	Carrier 39ER11						
AHU14	2nd Floor	Storage Room	1815	79.5	64.3	54.45		0.3	55.6	49.7	10.8	7.9	5.36	6	14	Low Velocity	150	Carrier 39LB06						

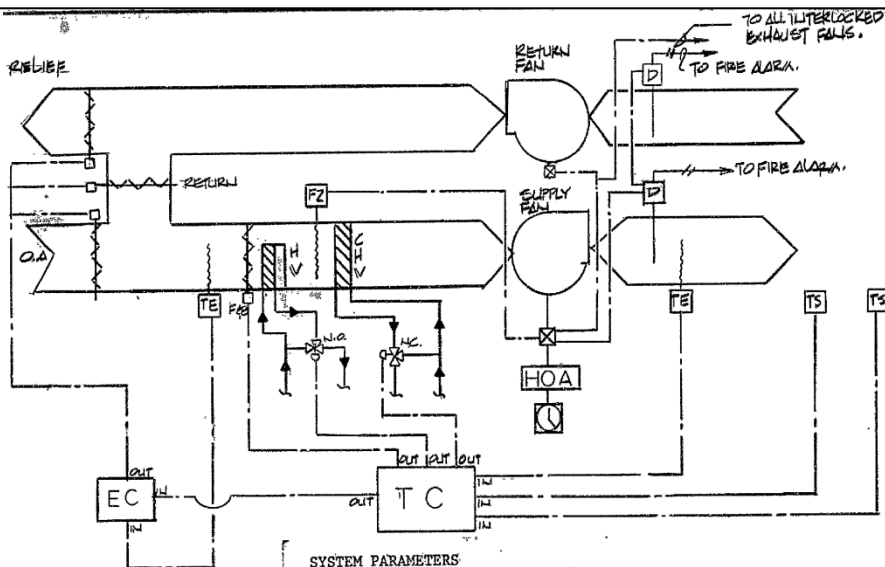
#### 4. Schematic Diagram:



### SYSTEM PARAMETERS

1. Start/stop via 7-day time clock with manual override.
2. Dry bulb economizer with motorized relief hood in space. Economizer setpoint reset from space thermostat input.
3. Supply air discharge temperature reset from space thermostat input.
4. 3-Way HW and CHW control valves to modulate in sequence with economizer controller to maintain supply air discharge temperature.
5. Provide minimum positioning outdoor air switch and low limit mixed air thermostat.

FIG 1: AHU 11 Single Zone Constant volume, Heating and cooling Water



### SYSTEM PARAMETERS

1. Start/stop via 7-day time clock with manual override. Return fan and all associated miscellaneous exhaust fans shall be energized via interlock with supply fan.
2. Dry bulb economizer with setpoint reset from space thermostat input.
3. Supply air discharge temperature reset from space thermostat input.
4. 3-Way HW and CHW control valves to modulate in sequence with economizer controller to maintain supply air discharge temperature.
5. Below 40°F O.A. temperature, 3-way HW coil shall be fully opened and setpoint shall be maintained by modulation of face and bypass dampers.
6. Provide minimum positioning outdoor switch and low limit mixed air thermostat.

FIG 2: AHU 14 Single Zone Constant volume, Heating and cooling Water

## 5. Sequence of Operation

- AHU 14:

The system is operated by WEEK blocks SFSS which starts the supply fan SFSS. When running the environment conditions are maintained by LOOP blocks HTTC and CCTC for heating and cooling respectively. Both loop blocks control the supply air temperature SATP, but and reset by the room condition RMTP. The room condition also determines heating or cooling by energizing the appropriate loop through TSTAT blocks RMHT for heating and RMCL for cooling. The cooling is obtained by sequencing the chilled water valves CLCV with the fresh air damper system CLDM the damper bring open to at least the minimum position by limit block CLCT. Should the outside air increase an above the setting of TSTAT blocks OATP the damper is held at the minimum position by start block OATP.

A flow switch FLSW will indicate an alarm FLAL on failure to match the normal state. Alarms are also generated by the freeze protection FZSW and in the case of AHU09 the smoke detection SKSW. In these cases the system will be stopped.

With the system being off the chilled water valve and the dampers will close while the heating valves will open.

- AHU 11:

The system will start through week block SFSS, which will run the supply fan SFSS which in turn will start the return fan RFSS. When running the environmental conditions are maintained by controlling the supply air temperature SATP through LOOP block SATP when is reset from the room temperature RMTP. The LOOP block controls either heating or cooling as dictated by the room requirements in STAT block RMCD. In the heating mode the heating valve HTCVC will modulate while the face and bypass damper HTDM will remain open to the coil. Should the outside air temperature fall below the setting of TSTAT block OALD the reverse will operate, the face and bypass damper will modulate and the heating valve will remain open. When the cooling mode as set by the room conditions the chilled water valve CLCV and the fresh air/exhaust dampers CLDM will control in sequence. The limit block SATC will ensure a minimum fresh air condition and should the outside air temperature increase above the setting of TSTAT block OATP the dampers will be held at the minimum fresh air condition. During unoccupied times if the room temperature RMTP fall below the setting of TSTAT block RMSB the system will start.

Flow switches in the supply SFSW and return RFSW will generate alarms should they not match the normal state. Alarms are also generated by the freeze stat FZSW and smoke detection SKSW, alarm blocks being FZAL and SKAL respectively. In both of these cases the system will be stopped.

When the system is off the cooling valve, fresh air/exhaust dampers will be closed and the heating valve will be open.

## 6. Submittals

- A. Product Data: Include manufacturer's technical literature for each AHU's and control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, and finishes for materials, installation and startup instructions for each type of product.

- B. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
- C. Qualification Data: For Installer and Manufacturer.
- D. Field quality-control test reports.
- E. Guarantee (Warranty): The contractor shall submit a written one "1" year guarantee under normal use of the new AHU's by the Embassy. Included in the guarantee will be provision and agreement to correct all deficiencies and defects in at the contractor's expenses.
- F. Work Schedule
- G. Operation and Maintenance manuals (Data): For AHU's instrumentation and control system to include in emergency, operation, and maintenance manuals to include the "Operation and Maintenance Data," include the following:
  - Maintenance instructions and lists of spare parts for each type of control device.
  - Interconnection wiring diagrams (As-Built) with identified and numbered system components and devices.
  - Inspection period, cleaning methods, cleaning materials and calibration tolerances.
  - Calibration records
  - Written description of sequence of operation including schematic diagram
  - Schematic diagrams for field sensors and control hardware.
  - Wiring diagrams for control units with termination numbers
  - Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

## **7. Quality Assurance**

- A. Installer Qualifications: An experienced installer who is an authorized representative, a certified installer, and/or an approved installer of the system manufacturer for both installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: A firm experienced in manufacturing HVAC systems similar to those indicated for this Project and with a record of successful in-service performance.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."
- E. Control systems and components shall be designed and installed in accordance with ASHRAE/ANSI Standard 135-1995 (BacNet) or Lonworks protocol.
- F. Site Supervisor will ensure the material is not damaged prior to or during installation, and that standard industry practices as defined in the International Building Code are applied and followed at all times.

- G. A final inspection will be held with the Embassy, contractor and the Site Supervisor to inspect for quality of the finished works.

## **8. General Conditions:**

- A. As there may be various conditions at the site, which are not clear in the Scope of Work, specifications, and drawings, it is important that each bidder verifies the work required. Each bidder must acquaint himself with the existing conditions and takes these conditions into consideration when preparing his bid. Lack of knowledge relative to the existing site conditions will not be allowed as basis for compensation. The contractor shall immediately report any discrepancies to the (COTR), and shall not begin the work until such matters are resolved.
- B. The contractor shall be responsible for damages to persons or property that occurs as a result of the contractor's fault or negligence. Contractor shall provide and maintain work environments and procedures, which will (1), safeguard the public and government personnel and property exposed to Contractor Operations and activities; and (2) avoid interruptions of government operations and delays in project completion date.
- C. For these purposes, the contractor shall:
- Provide appropriate safety barricades and signs to identify hazardous conditions at the job site.
  - Comply with standards issued by any local government authority having jurisdiction over occupational health and safety issues.
  - Contractor shall maintain work site clean and remove any debris **on regular basis**.
- D. The contractor's bid for the entire work shall provide for supervision of any or all trades that is not intended to be performed with his own forces
- E. The contractor shall verify Quantities set out in the Bills of Quantities as being the quantities of the Works required to be executed by him in accordance with the contract Drawings and Specifications and these will not be subject to re measurement on completion

## **9. Codes, Standards and References**

- A. All materials and workmanship shall comply with all applicable codes, specifications, local Jordanian ordinances, industry standards of latest editions
- B. The contractor performing the work must be familiar with industry standards applicable to that part of the work. The Contractor shall coordinate with the COTR all stages of the work, which shall be performed in accordance with the following Codes and standards:
1. American National Standards Institute
  2. International Building Codes
  3. American National Electric Code
  4. Occupational Safety And Health Standards

## **10. Project Schedule and workers.**

- A. Work days to be coordinated with Facilities Manager (FM)/Contracting Officer's Technical Representative (CTOR), work shall be performed during working hours, after working hours and during weekends.
- B. Contractor should submit proposed work schedule and project timeline for FM's/ COTR's approval.
- C. Work hours will be from 0800 to 1630, Saturday through Friday.



- D. The following must be approved prior to the contractor proceeding to the next phase.

## **11. Safety**

- A. Site Supervisor will ensure that all equipment used during the project is in safe operating condition. All personnel on the job site will be given the appropriate safety equipment. The Embassy reserves the right to stop the work if any unsafe conditions are found.
- B. All electrical equipment such as drills, grinding, buffing machines and any extension cords must be properly grounded and be free from any defect in the insulation
- C. All ladders/scaffoldings will be in good condition and used in a proper manner.

## **12. SECURITY**

- A. A list of all personnel working on the project along with Identification numbers must be submitted to the embassy no later than 5 working days prior to the beginning of actual starting date of the project.
- B. While on the Embassy property, all personnel must be escorted at all times. Any personnel found unescorted will be removed from the project immediately.
- C. Job site personnel will be issued a visitors badge by the Security staff, and this badge must be worn at all times.

## **13. COORDINATION**

- A. Coordinate location of temperature, pressure sensors, and other exposed control components with plans and room details before installation.
- B. Coordinate supply of conditioned electrical circuits for control units and operator workstation.
- C. Coordinate equipment with "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.

## **14. DEMONSTRATION**

Engage a factory-authorized service representative to train Government's maintenance personnel (up to 12 persons) to adjust, operate, and maintain HVAC instrumentation and controls 2 hours of training shall be performed.